NOx Control Cost Effectiveness Estimate

Engine Manufacturer	Cooper-Rolls		
Model No.	Coberra 125		
Engine Type Fuel Used	Natural Gas		Color Legend
Emissions Control	SCR		User Data / Information Input Cell
Combustion Control Purpose	NOx		"Cumulative" Cost Cell for Primary Categories
Target Reduction	75%		Cost Effectiveness (\$ / ton)
ngine Design Conditions			Comments
Power Output	14300	(hp)	Rated HP
Engine Exhaust Temperature		(F)	optional input
Engine Exhaust Rate Gas Volume		(lb/hr) (dscfm)	optional input optional input
		(dsciii)	<u> </u>
Il Load Engine Exhaust Composition:		[(m,1,0)]	Comments
Oxygen (O ₂₎		(vol. %)	optional input
Carbon Dioxide (CO ₂₎		(vol. %)	optional input
Water (H ₂ O) Oxides of Nitrogen (NOx)		(vol. %)	optional input optional input
Nitrogen (N ₂₁		(ppmvd) (vol. %)	optional input
NOx	21.	9 lb/hr 0.161 (lb/MMBtu)	NOx emissions from test data: 164.7 lb/MMSCF ~0.170 lb/MMB
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gine Parameters Total Operating Hours per Season	8760	(hrs) 100% utilization	Comments
· • • • • • • • • • • • • • • • • • • •	0.00	(me) 100% dumzduen	
nal Exhaust Gas Composition	F	5 lb/b= 0.040 (lb/MMD4) II	Comments
Oxides of Nitrogen (NOx)	5.	5 lb/hr 0.040 (lb/MMBtu)	Assume 75% reduction
onomic Parameters			Comments
Source of Cost Data	see Analysis		Analysis primarily relying on EPA Cost Manual
ect Costs Combustion Control Equipment and Auxiliary		Cost Formula	Comments
Equipment Equipment	\$2,765,000	(A)	Based on EPA control cost manual (\$167/kw; adjust to 2020\$)
Instrumentation	\$276,500	(O.1*A)	Calculated Cost using EPA Control Cost Manual
Sales Taxes	\$0	(0.03*(A+instrumentation))	No Oregon sales tax
Freight	\$138,250	(0.05*À)	Calculated Cost using EPA Control Cost Manual
Purchased Equipment Cost (PEC)	\$3,179,750	PEC	_
rect Installation Costs	#054.000	Cost Formula	Comments Coloridated Cost vising EDA Control Cost Manual
Foundations and Supports	\$254,380 \$445,170	(0.08*PEC)	Calculated Cost using EPA Control Cost Manual Calculated Cost using EPA Control Cost Manual
Handling and Erection Electrical	\$445,170 \$127,190	(0.14*PEC) (0.04*PEC)	Calculated Cost using EPA Control Cost Manual Calculated Cost using EPA Control Cost Manual
Piping	\$63,600	(0.04 FEC) (0.02*PEC)	Calculated Cost using EPA Control Cost Manual
Insulation for ductwork	\$31,800	(0.01*PEC)	Calculated Cost using EPA Control Cost Manual
Painting	\$31,800	(0.01*PEC)	Calculated Cost using EPA Control Cost Manual
Site Preparation	\$0	SP	Cost included with next row
Buildings	\$1,035,000	Bldg	Quote for major reconstruction to accommodate retrofit
		blug	Quote foi major reconstruction to accommodate retront
Total Installation Cost (TIC)	\$1,988,940	Bidg	Quote for major reconstruction to accommodate retroft
Total Direct Costs (PEC+TIC)			·
Total Direct Costs (PEC+TIC)	\$1,988,940 \$5,168,690	Cost Formula	Comments
Total Direct Costs (PEC+TIC) direct Costs Engineering	\$1,988,940 \$5,168,690 \$317,975	Cost Formula (0.10*PEC)	Comments Calculated Cost using EPA Control Cost Manual
Total Direct Costs (PEC+TIC)	\$1,988,940 \$5,168,690	Cost Formula	Comments
Total Direct Costs (PEC+TIC) direct Costs Engineering Construction and field expenses Contractor fees Start-up	\$1,988,940 \$5,168,690 \$317,975 \$158,988 \$317,975 \$63,595	Cost Formula (0.10*PEC) (0.05*PEC) (0.10*PEC) (0.02*PEC)	Comments Calculated Cost using EPA Control Cost Manual
Total Direct Costs (PEC+TIC) direct Costs Engineering Construction and field expenses Contractor fees Start-up Performance test	\$1,988,940 \$5,168,690 \$317,975 \$158,988 \$317,975 \$63,595 \$31,798	Cost Formula (0.10*PEC) (0.05*PEC) (0.10*PEC) (0.02*PEC) (0.01*PEC)	Comments Calculated Cost using EPA Control Cost Manual
Total Direct Costs (PEC+TIC) direct Costs Engineering Construction and field expenses Contractor fees Start-up Performance test Contingencies	\$1,988,940 \$5,168,690 \$317,975 \$158,988 \$317,975 \$63,595 \$31,798 \$95,393	Cost Formula (0.10*PEC) (0.05*PEC) (0.10*PEC) (0.02*PEC) (0.01*PEC) (0.01*PEC) (0.03*PEC)	Comments Calculated Cost using EPA Control Cost Manual
Total Direct Costs (PEC+TIC) direct Costs Engineering Construction and field expenses Contractor fees Start-up Performance test	\$1,988,940 \$5,168,690 \$317,975 \$158,988 \$317,975 \$63,595 \$31,798	Cost Formula (0.10*PEC) (0.05*PEC) (0.10*PEC) (0.02*PEC) (0.01*PEC)	Comments Calculated Cost using EPA Control Cost Manual
Total Direct Costs (PEC+TIC) direct Costs Engineering Construction and field expenses Contractor fees Start-up Performance test Contingencies Total Indirect Costs (IC)	\$1,988,940 \$5,168,690 \$317,975 \$158,988 \$317,975 \$63,595 \$31,798 \$95,393 \$985,723	Cost Formula (0.10*PEC) (0.05*PEC) (0.10*PEC) (0.02*PEC) (0.01*PEC) (0.01*PEC) (0.03*PEC)	Comments Calculated Cost using EPA Control Cost Manual
Total Direct Costs (PEC+TIC) direct Costs Engineering Construction and field expenses Contractor fees Start-up Performance test Contingencies Total Indirect Costs (IC) upital Cost Summary Total Direct Capital Costs (DC)	\$1,988,940 \$5,168,690 \$317,975 \$158,988 \$317,975 \$63,595 \$31,798 \$95,393 \$985,723	Cost Formula (0.10*PEC) (0.05*PEC) (0.10*PEC) (0.02*PEC) (0.01*PEC) (0.01*PEC) (0.03*PEC)	Comments Calculated Cost using EPA Control Cost Manual
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Total Direct Costs (PEC+TIC) direct Costs Engineering Construction and field expenses Contractor fees Start-up Performance test Contingencies Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI)	\$1,988,940 \$5,168,690 \$317,975 \$158,988 \$317,975 \$63,595 \$31,798 \$95,393 \$985,723	Cost Formula (0.10*PEC) (0.05*PEC) (0.10*PEC) (0.10*PEC) (0.02*PEC) (0.01*PEC) (0.03*PEC) (0.31*PEC)	Comments Calculated Cost using EPA Control Cost Manual Comments
Total Direct Costs (PEC+TIC) direct Costs Engineering Construction and field expenses Contractor fees Start-up Performance test Contingencies Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) rect Annual Costs	\$1,988,940 \$5,168,690 \$317,975 \$158,988 \$317,975 \$63,595 \$31,798 \$95,393 \$985,723 \$5,168,690 \$985,723 \$6,154,413	Cost Formula (0.10*PEC) (0.05*PEC) (0.05*PEC) (0.02*PEC) (0.01*PEC) (0.01*PEC) (0.03*PEC) (0.31*PEC) Cost Formula	Comments Calculated Cost using EPA Control Cost Manual Comments Comments
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Total Direct Costs (PEC+TIC) direct Costs Engineering Construction and field expenses Contractor fees Start-up Performance test Contingencies Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (IC) Total Capital Investment (TCI) rect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Materials Catalyst maintenance / replacement Testing and QA/QC Electricity Total Direct Annual Costs direct Annual Costs Overhead Administrative Charges Property Taxes Insurance Capital Recovery Total Indirect Annual Costs Immary Intel Direct Annual Operating Costs Intel Direct Annual Operating Costs Intel Direct Annual Operating Costs Intel Indirect Annual Operating Costs Intel Direct Annual Operating Costs	\$1,988,940 \$5,168,690 \$317,975 \$158,988 \$317,975 \$63,595 \$31,798 \$95,393 \$985,723 \$5,168,690 \$985,723 \$5,168,690 \$3,900 \$2,2530 \$26,000 \$3,900 \$22,530 \$26,000 \$3,900 \$22,530 \$26,000 \$138,250 \$20,000 \$2,500 \$244,180 \$36,540 \$123,088 \$61,544 \$31,544 \$31,544 \$61,544 \$324,338 \$607,054	Cost Formula (0.10*PEC) (0.05*PEC) (0.05*PEC) (0.02*PEC) (0.03*PEC) (0.31*PEC) Cost Formula nominal cost	Comments Calculated Cost using EPA Control Cost Manual Comments Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratic 5 hours per week (1 hr x 5 days); job category labor rate Engineering Estimate Engineering Estimate Engineering Estimate (5% of Cap Cost) Engineering estimate - Annual test; reagent controller QA Estimate based on analysis in PA DEP TSD Comments Engine ACT Document Engine ACT Document Engine ACT Document Factor for costs annualized over 30 years at 3.25% interest. F = i* (1+i)^n / [(1+i)^n - 1] (i expressed as a decimal - e.g., 10% =
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Total Direct Costs (PEC+TIC) direct Costs Engineering Construction and field expenses Contractor fees Start-up Performance test Contingencies Total Indirect Costs (IC) Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) rect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Labor Maintenance - Materials Catalyst maintenance / replacement Testing and QA/QC Electricity Total Direct Annual Costs Overhead Administrative Charges Property Taxes Insurance Capital Recovery Total Indirect Annual Costs Immary Ital Direct Annual Operating Costs Intel Operating Costs Inte	\$1,988,940 \$5,168,690 \$317,975 \$158,988 \$317,975 \$63,595 \$31,798 \$95,393 \$985,723 \$5,168,690 \$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$22,530 \$26,000 \$5,000 \$138,250 \$20,000 \$2,500 \$138,250 \$20,000 \$41,180 \$36,540 \$123,088 \$61,544 \$324,338 \$607,054	Cost Formula (0.10*PEC) (0.05*PEC) (0.05*PEC) (0.02*PEC) (0.03*PEC) (0.31*PEC) Cost Formula nominal cost	Comments Calculated Cost using EPA Control Cost Manual Comments Comments Comments Shours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratic 5 hours per week (1 hr x 5 days); job category labor rate Engineering Estimate Engineering Estimate Engineering Estimate Engineering Estimate Engineering Estimate Comments Comments Comments Engine ACT Document
Total Direct Costs (PEC+TIC) direct Costs Engineering Construction and field expenses Contractor fees Start-up Performance test Contingencies Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (IC) Total Indirect Capital Costs (IC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) rect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Materials Catalyst maintenance / replacement Testing and QA/QC Electricity Total Direct Annual Costs direct Annual Costs Overhead Administrative Charges Property Taxes Insurance Capital Recovery Total Indirect Annual Costs annual Costs control of the Costs	\$1,988,940 \$5,168,690 \$317,975 \$158,988 \$317,975 \$63,595 \$31,798 \$95,393 \$985,723 \$5,168,690 \$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$22,530 \$26,000 \$5,000 \$138,250 \$20,000 \$2,500 \$138,250 \$20,000 \$41,180 \$36,540 \$123,088 \$61,544 \$324,338 \$607,054	Cost Formula (0.10*PEC) (0.05*PEC) (0.05*PEC) (0.02*PEC) (0.02*PEC) (0.01*PEC) (0.03*PEC) (0.31*PEC) (0.31*PEC) (0.31*PEC) (0.31*PEC) (0.05*Cost Formula (0.05*Cost	Comments Calculated Cost using EPA Control Cost Manual Comments Comments Comments Shours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratic 5 hours per week (1 hr x 5 days); job category labor rate Engineering Estimate Engineering Estimate Engineering Estimate Engineering Estimate Engineering Estimate Comments Comments Comments Engine ACT Document

NOx Control Cost Effectiveness Estimate

Engine Manufacturer	Cooper-Rolls		
Model No. Engine Type	Coberra 125		
Fuel Used	Natural Gas		Color Legend
Emissions Control	SCR		User Data / Information Input Cell
Combustion Control Purpose Target Reduction	NOx 75%		"Cumulative" Cost Cell for Primary Categories Cost Effectiveness (\$ / ton)
-	1070	■	
ngine Design Conditions Power Output	14300	(hp)	Comments Rated HP
Engine Exhaust Temperature		(F)	optional input
Engine Exhaust Rate		(lb/hr)	optional input
Gas Volume		(dscfm)	optional input
III Load Engine Exhaust Composition:			Comments
Oxygen (O ₂₎		(vol. %)	optional input
Carbon Dioxide (CO ₂₎		(vol. %)	optional input
Water (H ₂ O) Oxides of Nitrogen (NOx)		(vol. %) (ppmvd)	optional input optional input
Nitrogen (Nox)		(vol. %)	optional input
NOx	23.1	1 lb/hr 0.170 (lb/MMBtu)	NOx emissions from test data: 172.9 lb/MMSCF ~0.170 lb/MMB
ngine Parameters			Comments
Total Operating Hours per Season	8760	(hrs) 100% utilization	Comments
			0
nal Exhaust Gas Composition Oxides of Nitrogen (NOx)	5.5	3 lb/hr 0.043 (lb/MMBtu)	Comments Assume 75% reduction
	5.0	0.043 (ib/iviivibtu)	
onomic Parameters Source of Cost Data	see Analysis		Comments Analysis primarily relying on EPA Cost Manual
	See Allalysis	0-45	, , , , , , , , , , , , , , , , , , ,
rect Costs Combustion Control Equipment and Auxiliary	00 === ===	Cost Formula	Comments
Equipment	\$2,765,000	(A)	Based on EPA control cost manual (\$167/kw; adjust to 2020\$)
Instrumentation	\$276,500	(0.1*A)	Calculated Cost using EPA Control Cost Manual
Sales Taxes Freight	\$0 \$138,250	(0.03*(A+instrumentation)) (0.05*A)	No Oregon sales tax Calculated Cost using EPA Control Cost Manual
Purchased Equipment Cost (PEC)	\$3,179,750	PEC	Calculated Cost using EFA Control Cost Mandal
rect Installation Costs	40 , 170,100	Cost Formula	Comments
Foundations and Supports	\$254,380	(0.08*PEC)	Calculated Cost using EPA Control Cost Manual
Handling and Erection	\$445,170	(0.14*PEC)	Calculated Cost using EPA Control Cost Manual
Electrical	\$127,190	(0.04*PEC)	Calculated Cost using EPA Control Cost Manual
Piping	\$63,600	(0.02*PEC)	Calculated Cost using EPA Control Cost Manual
Insulation for ductwork Painting	\$31,800 \$31,800	(0.01*PEC) (0.01*PEC)	Calculated Cost using EPA Control Cost Manual Calculated Cost using EPA Control Cost Manual
Site Preparation	\$0	SP	Cost included with next row
Buildings	\$1,035,000	Bldg	Quote for major reconstruction to accommodate retrofit
Total Installation Cost (TIC)	\$1,988,940		
Total Direct Costs (PEC+TIC)	\$5,168,690	- I	
direct Costs	0047.075	Cost Formula	Comments
Engineering Construction and field expenses	\$317,975 \$158,988	(0.10*PEC) (0.05*PEC)	Calculated Cost using EPA Control Cost Manual Calculated Cost using EPA Control Cost Manual
Contractor fees	\$317,975	(0.10*PEC)	Calculated Cost using EPA Control Cost Manual
Start-up	\$63,595	(0.02*PEC)	Calculated Cost using EPA Control Cost Manual
Performance test	\$31,798	(0.01*PEC) (0.03*PEC)	Calculated Cost using EPA Control Cost Manual Calculated Cost using EPA Control Cost Manual
	COE 303	(U.U3 FEC)	
Contingencies	\$95,393 \$985,723		Calculated Cook doing 2171 Control Cook Mariadi
Contingencies Total Indirect Costs (IC)	\$95,393 \$985,723	(0.31*PEC)	•
Contingencies Total Indirect Costs (IC) apital Cost Summary	\$985,723		Comments
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC)	\$985,723 \$5,168,690		•
Contingencies Total Indirect Costs (IC) apital Cost Summary	\$985,723		-
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI)	\$985,723 \$5,168,690 \$985,723	(0.31*PEC)	Comments
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) irect Annual Costs	\$985,723 \$5,168,690 \$985,723 \$6,154,413	(0.31*PEC) Cost Formula	Comments
Contingencies Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TC) irect Annual Costs Operator Labor Supervisor Labor	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900	(0.31*PEC)	Comments Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) Irect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$22,789	Cost Formula Inominal cost	Comments Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratio
Contingencies Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) rect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Labor	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$23,789 \$26,000	Cost Formula nominal cost nominal cost	Comments Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratio 5 hours per week (1 hr x 5 days); job category labor rate
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) irect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Labor Maintenance - Materials	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$23,789 \$26,000 \$5,000	Cost Formula Inominal cost	Comments Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar rations from the second se
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) irect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Labor	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$23,789 \$26,000 \$5,000 \$138,250 \$20,000	Cost Formula nominal cost nominal cost	Comments Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratic 5 hours per week (1 hr x 5 days); job category labor rate Engineering Estimate Engineering Estimate Engineering Estimate (5% of Cap Cost) Engineering estimate - Annual test; reagent controller QA
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) irect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Labor Maintenance - Materials Catalyst maintenance / replacement Testing and QA/QC Electricity	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$23,789 \$26,000 \$5,000 \$138,250 \$20,000 \$2,500	Cost Formula nominal cost nominal cost	Comments Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar rations to hours per week (1 hr x 5 days); job category labor rate Engineering Estimate Engineering Estimate Engineering Estimate
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) Irect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Labor Maintenance - Materials Catalyst maintenance / replacement Testing and QA/QC	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$23,789 \$26,000 \$5,000 \$138,250 \$20,000	Cost Formula nominal cost nominal cost	Comments Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratic 5 hours per week (1 hr x 5 days); job category labor rate Engineering Estimate Engineering Estimate Engineering Estimate (5% of Cap Cost) Engineering estimate - Annual test; reagent controller QA
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TC) rect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Labor Maintenance - Labor Maintenance - Materials Catalyst maintenance / replacement Testing and QA/QC Electricity Total Direct Annual Costs	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$23,789 \$26,000 \$5,000 \$138,250 \$20,000 \$2,500 \$245,439	Cost Formula nominal cost nominal cost nominal cost Cost Formula Capital Recovery Factor	Comments Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratic 5 hours per week (1 hr x 5 days); job category labor rate Engineering Estimate Engineering Estimate Engineering Estimate (5% of Cap Cost) Engineering estimate - Annual test; reagent controller QA
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) irect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Labor Maintenance - Materials Catalyst maintenance / replacement Testing and QA/QC Electricity Total Direct Annual Costs direct Annual Costs Overhead	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$23,789 \$26,000 \$138,250 \$20,000 \$2,500 \$245,439	Cost Formula Inominal cost Ino	Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratic 5 hours per week (1 hr x 5 days); job category labor rate Engineering Estimate Engineering Estimate Engineering Estimate (5% of Cap Cost) Engineering estimate - Annual test; reagent controller QA Estimate based on analysis in PA DEP TSD Comments
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (DC) Total Indirect Capital Costs (DC) Total Capital Investment (TCI) irect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Labor Maintenance - Labor Catalyst maintenance / replacement Testing and QA/QC Electricity Total Direct Annual Costs Overhead Administrative Charges	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$23,789 \$26,000 \$5,000 \$138,250 \$20,000 \$2,500 \$245,439 \$36,540 \$123,088	Cost Formula nominal cost nominal cost Cost Formula Cost Formula Cost Formula Capital Recovery Factor (0.6*(OL+SL+ML+MM)) (0.02*TCI)	Comments S hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratio 5 hours per week (1 hr x 5 days); job category labor rate Engineering Estimate Engineering Estimate (5% of Cap Cost) Engineering estimate - Annual test; reagent controller QA Estimate based on analysis in PA DEP TSD Comments Engine ACT Document
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Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) rect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Labor Maintenance - Labor Maintenance - Materials Catalyst maintenance / replacement Testing and QA/QC Electricity Total Direct Annual Costs direct Annual Costs Overhead Administrative Charges Property Taxes Insurance Capital Recovery	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$23,789 \$26,000 \$138,250 \$20,000 \$2,500 \$245,439 \$36,540 \$123,088 \$61,544 \$61,544 \$324,338	Cost Formula nominal cost nominal cost cost Formula Capital Recovery Factor (0.6°(OL+SL+ML+MM)) (0.02*TCI) (0.01*TCI) (0.01*TCI) CRF CRF[TCI] 0.0527	Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratio 5 hours per week (1 hr x 5 days); job category labor rate Engineering Estimate Engineering Estimate (5% of Cap Cost) Engineering estimate - Annual test; reagent controller QA Estimate based on analysis in PA DEP TSD Comments Engine ACT Document Engine ACT Document Factor for costs annualized over 30 years at 3.25% interest.
Total Indirect Costs (IC) apital Cost Summary Total Direct Capital Costs (DC) Total Indirect Capital Costs (DC) Total Indirect Capital Costs (IC) Total Capital Investment (TCI) Trect Annual Costs Operator Labor Supervisor Labor Operating Materials - ammonia Maintenance - Labor Maintenance - Materials Catalyst maintenance / replacement Testing and QA/QC Electricity Total Direct Annual Costs Overhead Administrative Charges Property Taxes Insurance	\$985,723 \$5,168,690 \$985,723 \$6,154,413 \$26,000 \$3,900 \$23,789 \$26,000 \$5,000 \$138,250 \$20,000 \$2,500 \$245,439 \$36,540 \$123,088 \$61,544 \$61,544	Cost Formula nominal cost nominal cost cost Formula Capital Recovery Factor (0.6°(OL+SL+ML+MM)) (0.02*TCI) (0.01*TCI) (0.01*TCI) CRF CRF[TCI] 0.0527	Comments 5 hours per week (1 hr x 5 days); job category labor rate 15% of operator materials estimate annual NH3 at \$700 per ton; 1.1 molar ratio 5 hours per week (1 hr x 5 days); job category labor rate Engineering Estimate Engineering Estimate (5% of Cap Cost) Engineering estimate - Annual test; reagent controller QA Estimate based on analysis in PA DEP TSD Comments Engine ACT Document Engine ACT Document Factor for costs annualized over 30 years at 3.25% interest.
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